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Domine of horses.

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DOURINE OF HORSES

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Contribution from the Bureau of Animal Industry

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DOURINE is a specific infectious disease which under natural conditions affects only the horse and the ass. It is transmitted from animal to animal by coition, and is caused by a microscopic animal parasite, the *Trypanosoma equiperdum*. The first symptoms appear in the genital tract. The parasites then gain entrance into the blood stream and eventually attack the nervous system. The disease usually runs a chronic course, finally producing complete paralysis of the hind quarters and resulting in death.

Dourine has been described under various names according to the country in which it is found. Chief among them may be mentioned "el dourine," "maladie du coït," "covering disease," "equine syphilis," "genital glanders," "breeding paralysis," "chancrous epizootic," and "epizootic paraplegia." In the United States the most common name for the affection is the short and distinctive term "dourine," which is Arabic for unclean.

DOURINE OF HORSES.

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HISTORY OF EARLY OUTBREAKS.

DOURINE is supposed to have come from Asia, where the disease is believed to have existed for centuries. It is thought to have been introduced into continental Europe during the early part of the nineteenth century through the importation of breeding horses, especially Arab stallions, from the Orient.

In the United States the disease was first suspected in 1885 and definitely recognized in 1886 in Illinois. The infection was traced to a stallion imported from France in 1882. Officials of the State of Illinois took charge of the outbreak, and as a result of rigid measures the disease was eradicated from the State in 1888, but not before an infected stallion had been shipped to Gordon, Nebr., thereby setting up a new center of infection. Dourine broke out there in 1892, but was apparently eradicated through the control measures of the Bureau of Animal Industry, although it reappeared in 1899 and again in 1901 with increased vigor in the Pine Ridge and Rosebud Indian Reservations, S. Dak. The work of eradicating the disease in that section was continued until 1905, when the last suspicious cases were destroyed. Several outbreaks were also reported in Iowa, continuing until 1911. In each instance vigorous methods of control and eradication were adopted by both the State and Federal authorities.

At that time the methods of diagnosis were limited to a physical examination, which, owing to the nature of the disease, was unsatisfactory at its best. But in 1912, when dourine was again reported, this time in Montana, the reliability and practical application of blood tests had been determined. A test known as the complement-fixation test was used in diagnosing the disease; and by its use dourine was found to exist not only in Montana but also in North Dakota, South Dakota, Arizona, New Mexico, Wyoming, and Nebraska. It was most prevalent on the Indian reservations in some of those States. Since 1912 the disease has been eradicated from Nebraska, and a small outbreak that occurred in Iowa in 1915 was also stamped out, and the excellent progress made in the other States leads to the belief that its complete eradication will be accomplished in the near future.

In Canada the presence of dourine was discovered in 1904, and there also use is being made of the complement-fixation test as a means of diagnosis in controlling and eradicating the disease.

CAUSE AND TRANSMISSION OF THE DISEASE.

Dourine is a disease of breeding animals, and under natural conditions affects only horses and asses. However, it may be transmitted artificially not only to those animals but also to dogs, rabbits, rats, and other susceptible animals by means of inoculation with relatively large quantities of the blood and membranes of certain organs of animals affected with the disease. Copulation, however, is by far the most common means of transmission; other means are so rare that they have no practical importance in the adoption of measures for suppressing the disease.

The organism causing dourine is an animal parasite of microscopic size known scientifically as *Trypanosoma equiperdum*. This trypanosome has the ability to penetrate the intact lining of the genital tract, from which it reaches the blood and later the more distant parts of the body. Its disease-producing action seems to result from the production of certain poisons which act, first, on the end nerves and later on the general nervous system, leading to a degeneration of those parts.

Although the predisposition of horses and asses to the infection is marked, not all stallions which serve diseased mares or all mares served by infected stallions contract the disease. According to one authority, about 66 per cent of the mares exposed to infection become diseased. Cases are on record in which a healthy stallion has transmitted the disease from an infected to a healthy mare without contracting the disease himself.

A number of the animals affected with dourine are latent cases; that is, they do not show any perceptible symptoms of the disease, although it is possible for them, even in this stage, to infect others to which they are bred. Meanwhile any condition which tends to lower the vitality of the animal,—as hard work, exposure, and lack of feed—may aggravate the disease and bring about the development of noticeable symptoms.

SYMPTOMS.

There are many variations in the symptoms of dourine, and this is particularly true of the disease as it exists in the United States. In order to give a fair idea of the symptoms that may be found it is necessary to describe manifestations which may appear in a number of horses. Each individual may have several but not all the symptoms enumerated.

Two distinct stages of the disease may be noted; the first concerns chiefly the sexual organs, but in the second stage, symptoms indicating an affection of the nervous system are more prominent. After exposure to infection and before symptoms of the disease appear there is a variable period ranging from 8 days to 2 months.

In the stallion there is first an irritation and swelling about the penis. The swelling extends throughout the organ, which may be continually protruded, with frequent erections. The swelling may also involve the groin, with an enlargement of the lymph glands in that region, and then extend forward along the abdomen. In a few days the penis shows small blisters, which break, discharging a yellowish fluid and leaving irregular, raw ulcers, which, if situated near one another, have a tendency to run together, resulting in a

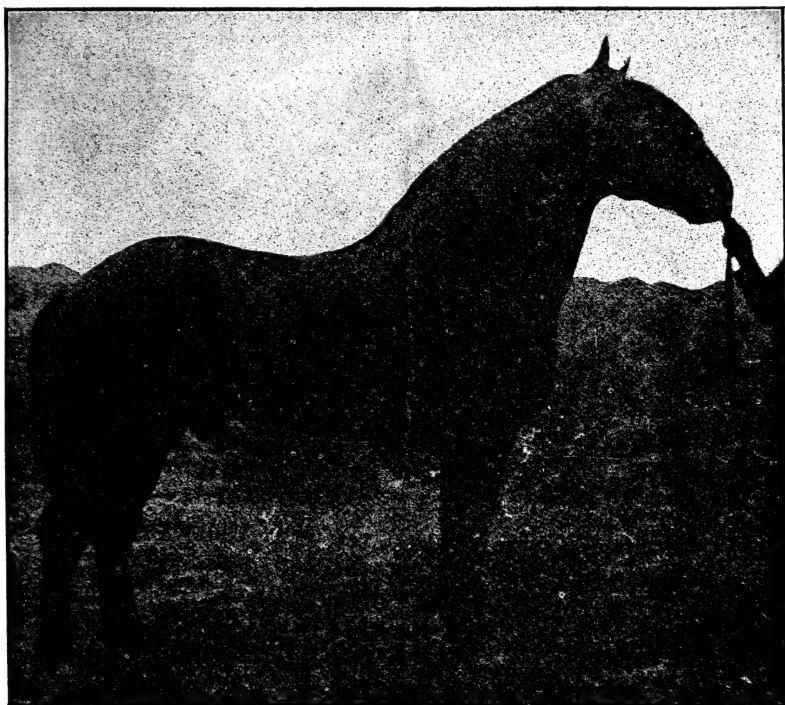


FIG. 1.—Stallion in good condition at time of purchase. (Dourine afterwards developed.)

large raw surface with an irregular border. The ulcers show a tendency to heal rapidly, leaving white scars, which are permanent. In some cases the urinary opening is very red and swollen, and a yellowish fluid may drip from it. The stallion retains his breeding instinct and becomes very amorous when brought in the vicinity of mares. If allowed access to mares in season, service is often impossible, owing to the fact that a complete erection of the penis does not occur. The testicles may be involved and become tender to pressure, and abscess formation and sloughing may occur. In certain cases the initial symptoms may be so slight as to pass unnoticed, which is especially true of animals running on the open range and not seen by the owner for long periods.

In mares the disease, being the result of copulation, begins with swelling and inflammation of the genitals, exposing the clitoris, which

is continually in a state of erection. There may also be a discharge similar to that observed in the stallion, and it may be profuse or slight in quantity. The mare will switch the tail, appear uneasy, and urinate frequently. Vesicles or blisters soon appear on the external genitals as well as on the internal lining of those organs. The blisters soon rupture, which is the initial stage in the formation of deep, angry ulcers, which show a tendency to heal rapidly, invariably leaving a permanent scar and causing a slight puckering of the tissue. On the dark skin of the external genitals these scars are always

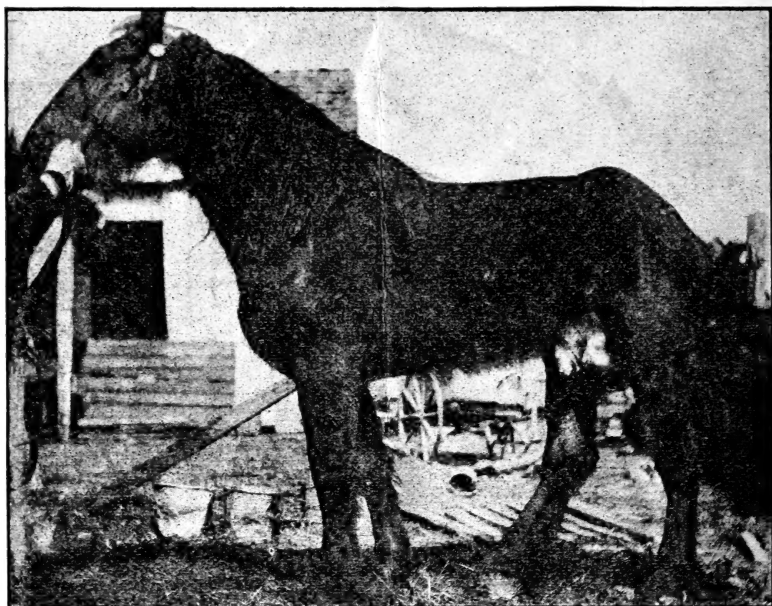


FIG. 2.—A chronic case of dourine. (Same stallion as shown in fig. 1 after the disease had developed.)

white, more or less circular in outline, from one-eighth to one-half inch in diameter, and pitlike, similar to the depression in a pock-mark. (See fig. 3.) These marks are permanent and not temporary as in coital exanthema and other affections resembling it. Swellings in the region of the genitals and the mammary glands frequently occur.

Sometimes the lesions described disappear gradually and the disease may remain in abeyance for months or even years. The apparent recovery, however, as a rule, is not permanent, and any excessive work or excitement, especially copulation, may set up the disease anew. Mares may abort during pregnancy, but many fine colts have been born to affected mares.

The nervous or constitutional disturbances of the second stage may not come on for months or even years after the appearance of the local lesions, and are similar in both male and female. They consist of a general nervous disorder with a staggering, swaying gait, espe-

cially in the hind legs. The animal becomes extremely emaciated, particularly in the hind quarters, and "tucked up" in the flanks.

The first indication in paralysis is noted in traveling, when the animal fails to pick up one of the hind feet as evenly as the other. There is a tendency to drag the foot partially, which will wear the toe off more than normal. This condition may shift from one hind foot to the other, or both may become affected simultaneously, and then knuckling is a common symptom.

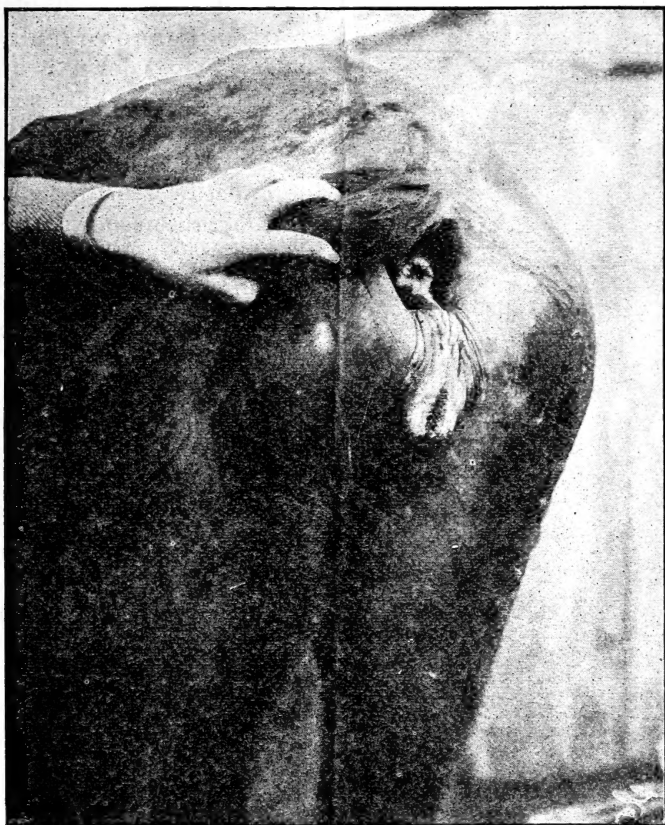


FIG. 3.—Dourine involving the external genitals and perineum of a mare. Note the areas from which color has disappeared.

Only occasionally are the nerves of the forelegs and face affected, the latter being manifested in paralysis of an ear, an eyelid, a nostril, or a lip, or all combined. (See fig. 4.) Twitching of the superficial muscles has also been noticed in several instances. Swellings or plaques may break out on various parts of the body, especially on the croup, belly, or neck. They may disappear in a few days, only to reappear at some other point. These swellings are round, flat, and about the size of a half dollar, sometimes larger. When punctured, a bloody serum oozes out of the cut surface. Figure 5 illustrates the appearance of the plaques.

There may be noted also an inflammation of the skin which causes the animal to rub itself frequently, while spots may be present on the hind legs and in the region below the genitals, as a result of the discharge from the penis or vagina coming into contact with the skin and causing a destruction of the coloring matter.

The temperature of the animal seldom goes above 101° or 102° F. Labored breathing is occasionally noted, and in some cases the glands under the jaw swell and a discharge appears from the nostril, simulating glanders. When paralysis of the hind limbs appears it usually

progresses rapidly. The horse goes down, is unable to rise, and dies in a short time from nervous exhaustion. Until the last, however, the appetite remains good, and the stallion shows a desire for the mare, although service is impossible.

POST-MORTEM LESIONS.

The post-mortem lesions may vary considerably, depending on the severity of the initial attack of the disease and the length of time the animal has been affected. The following lesions may be noted, but their presence and extent are governed by conditions described.

In the mare the lining membrane of the vulva and vagina shows swelling and gelatinous infiltration, together with considerable congestion of the blood vessels. The lining of the womb is



FIG. 4.—Showing facial paralysis.

thickened and corrugated, and sometimes ulcers are present. The whole internal lining of the organ may be orange colored, may be covered with a discharge of mucous pus, and occasionally may show small, irregular, yellowish patches. The ovaries are frequently involved, and may show hemorrhages and a large blood clot in their interior. Where the discharge from the genital organs has come into contact with the skin there are irregular-shaped whitish spots.

In the male the penis is usually enlarged, although in some cases normal in size. It frequently contains ulcers or scar tissue on its surface or in the urethral canal. The sheath is also swollen and the

skin thickened. The testicles in some cases are soft and smaller than normal, while in others the opposite is found. Adhesions may be found between the different coverings of the testicles. In nearly all cases the scrotum is infiltrated.

The lymphatic glands in the groin also are inflamed, and in many cases may be plainly visible as irregular, wavy lines under the skin. There is also a yellowish, gelatinous material beneath the skin in those areas where plaques were situated just before death. In cases of long duration there is more or less marked shrinkage of the muscular system, a condition naturally following the paralysis which

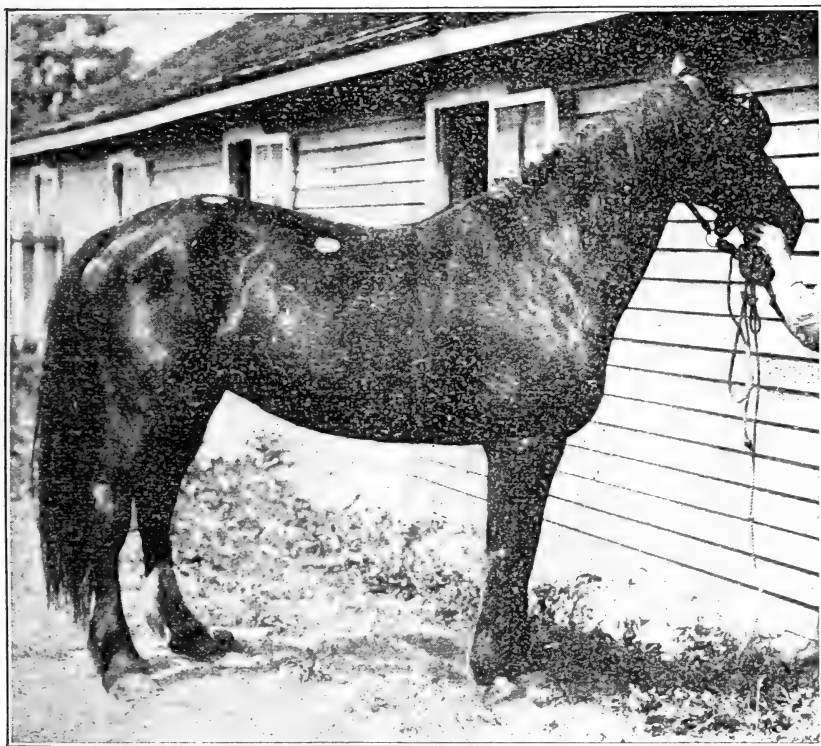


FIG. 5.—Showing plaques.

precedes death. Changes are noted in the brain, spinal cord, and spinal nerves, pointing to a degeneration of those parts, with an influx of fluid and formation of numerous hemorrhagic areas. The skeleton is also affected, and the bones may be softened. The bone marrow is congested, and hemorrhages and erosions may be seen on the articular cartilages of the joints. A discoloration of the joint fluid due to red blood cells is frequently seen, giving it a peculiar pinkish color.

COURSE AND OUTCOME OF THE DISEASE.

The course of the disease is extremely variable and may cover a long period of time. At the commencement of the attack the

genital symptoms alone are observable. Sooner or later, however, the case becomes complicated by the appearance of the systematic or nervous disturbances, including staggering gait, loss of flesh, and paralysis of the hind legs. As the symptoms become gradually intensified the animal goes down and death soon follows.

The course of the disease is markedly influenced by the conditions and environment to which the animal has been subjected. Bad weather, exposure, insufficient food, and complicating diseases like influenza, distemper, or, in fact, any condition which tends to lower the vitality of the animal, hastens the termination of the disease. On the other hand good care and abundant feed will prolong life and may even result in recovery. It is also possible, under favorable conditions, that an animal may have dourine in the latent form for years without manifesting any symptoms and yet be a source of danger.

Although now and then a case of dourine may recover, as a rule the disease is still present in a latent state, and the excitement of copulation is very likely to cause it to reappear with increased vigor. The outlook, therefore, is always to be considered unfavorable, and, in a country where a relatively small number of cases appear, temporizing methods of suppressing the disease are not warranted.

DIAGNOSIS.

Until recent years the diagnosis of dourine in the field rested solely on physical examination. As the disease is of such a nature that physical symptoms may not always be present, it readily is seen that the value of that method of diagnosis is limited, for only cases in which animals showed physical symptoms at the time of examination would be detected, and latent cases would be overlooked entirely.

In 1912 the serum diagnosis of infectious diseases had been placed on a sound basis in veterinary as well as human medicine. The complement-fixation test used in the diagnosis of glanders in horses had proved to be entirely reliable, and when, in 1912, dourine was reported in Montana, steps were immediately taken to apply that test to dourine. After extensive experimental work a method was developed which gave satisfactory results, and the practical use of the test in the control and eradication of dourine in this country and in Canada has demonstrated its accuracy and value. In countries where but one trypanosome disease exists the complement-fixation test is of inestimable value as a diagnostic agent, for while the reaction to the test is the same for all diseases caused by pathogenic trypanosomes, dourine is the only disease of that kind known to exist in the United States. By the use of the complement-fixation test it is possible to detect even the latent cases of dourine. Animals affected with any other diseases existing in the United States do not react to the test for dourine.

The test is primarily a laboratory one, in which the blood serum of the suspected animal is utilized to determine whether the animal in question has been infected with the trypanosome of dourine. The principles of the complement-fixation reaction are recognized the scientific world over, and its technic is extensively employed in both human and veterinary medicine. The Wassermann test used in the diagnosis of syphilis in man is a complement-fixation reaction, while satisfactory results are obtained in the diagnosis of glanders in horses and contagious abortion in cattle by complement fixation.

The Bureau of Animal Industry will apply the test for dourine when samples of blood serum from animals suspected of being affected with or exposed to the disease are submitted for examination. As considerable skill and experience are required in properly preparing serum samples, this work should be done by a qualified veterinarian. The samples, prepared according to the directions which follow, should be forwarded to the Chief of the Bureau of Animal Industry, Pathological Division, Washington, D. C., and a letter giving a history of the samples should be mailed to him the same day.

DIRECTIONS FOR THE COLLECTION OF BLOOD SERUM FOR LABORATORY DIAGNOSIS.

As the serum is the constituent of the blood which is utilized in applying the complement-fixation test, it is extremely important to send good specimens to the laboratory in order that a conclusive and reliable diagnosis may be made. To obtain a good, clear specimen of serum the following procedure is recommended:

Draw 4 ounces or more of blood from the jugular vein of the suspected animal into a dry, clean, preferably sterile, wide-mouthed bottle. The blood should not be collected until a steady stream flows from the cannula of the trocar. After the bottle is filled set it carefully to one side and allow it to stand for at least 30 minutes, or until complete coagulation has taken place. It is important to see that the blood is not disturbed until complete coagulation has occurred, as the serum will not separate so readily if agitated before coagulation takes place. The sample may then be moved if desired. The clotted blood should be allowed to stand for six hours longer, or until the clear yellow serum separates from the clot.

When a sufficient quantity of serum has separated from the clot pour off from 2 to 4 drams into a small vial, being very careful not to allow the entrance of any red cells. If after six hours the clot fails to contract sufficiently to allow the yellow serum to separate from it, the process may be accomplished by carefully loosening the clotted blood from the sides of the bottle by means of a sterile wire. The sample is then permitted to stand long enough for the clot to contract, leaving the clear yellow serum above, which should then be poured off.

If the sample is to be shipped a considerable distance or in warm weather, the serum should be carbolyzed 0.5 per cent by adding 1 part of a 5 per cent solution of carbolic acid to 9 parts of serum. It is important not to exceed those proportions of carbolic acid and serum.

The vial in which the serum is to be forwarded should be properly labeled, giving (a) a description of the animal from which the sample was obtained—whether a horse or an ass, (b) owner's name and address, and (c) name of person sending the sample.

TREATMENT.

Little benefit can be obtained from the medicinal treatment of dourine, nor is such treatment desirable in this country where the

disease has existed only in restricted areas and where sanitary considerations demand its prompt extirpation.

The Bureau of Animal Industry nevertheless has conducted experiments along lines of treatment in animals affected with the disease. Various drugs likely to be most useful in combating trypanosome infection were used, but the results were unsatisfactory. The very high cost of these drugs, together with the expense of handling the animals, would make such treatment impracticable even though beneficial results had been obtained.

METHOD OF ERADICATION.

Sanitary measures looking to the eradication of dourine must depend on the principle that horses infected with the disease should be prevented from breeding. This conclusion is well founded, for in spite of the possibility of recovery there are, as a matter of fact, frequent relapses, and trypanosomes may exist for many months in the sexual organs of animals apparently recovered. Therefore it is very essential to destroy diseased animals as soon as possible. The objections to spaying the mares and castrating the stallions is that such mares on the open range may be covered by stallions and that infected stallions even after castration may cover healthy mares.

Dourine, being conveyed under natural conditions solely by the act of coition, is not a difficult disease to stamp out in a farming community, but eradication is a more difficult task on the open range. With good cooperation among Federal Government officials, State authorities, and horse owners, however, these difficulties can be overcome.

A number of the veterinarians of the Bureau of Animal Industry are stationed in States where dourine exists, and they cooperate with the State veterinarians and their deputies in the work of eradication. In the spring of the year, before the animals are bred, samples of blood serum are drawn from all breeding animals in districts where dourine exists or is suspected. These samples of serum are properly identified and forwarded to the Pathological Division of the bureau and are subjected to the complement-fixation test for dourine. The animals are held in virtual quarantine until the results of the test are received. Animals whose serums give positive results are destroyed. The owner is reimbursed for the loss of the animal, the State and Federal Governments sharing the expense equally, but not to exceed \$100 on the part of the latter. On the Indian reservations the entire expense is borne by the Federal Government. Animals whose serums give negative results are considered to be free of infection and are released for breeding.

About 50,000 samples of serum are tested annually. The percentage of reactors is growing smaller each year, and the outlook for the complete eradication of dourine in the near future is bright.

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